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SAURICHTHYS (PISCES, ACTINOPTERYGII) FROM THE EARLY TRIASSIC OF QUEENSLAND

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ABSTRACT

The first description of a Triassic fish from Queensland is based on part of a skull of *Saurichthys* cf. *S. gigas* (Woodward 1890) from the freshwater Arcadia Formation at Rewan Crater, SE Queensland. Its occurrence confirms the age of the Rewan vertebrate fauna as no older than Lower Triassic.

INTRODUCTION

The Triassic fishes of Queensland are virtually unknown. Hills (1958) mentioned the existence of fragmentary (though unspecified) fish remains, and the rich vertebrate fauna of the Arcadia Formation (formerly the Rewan Formation, see Jensen 1975) is known to include patches of actinopterygian scales preserved in coprolites, and occasional lungfish toothplates (Bartholomai and Howie 1970, Howie 1972). The first identifiable portion of fish skull was recently collected from the Arcadia Formation and is described here. The skull fragment is referred to the cosmopolitan Triassic genus *Saurichthys,* and its discovery supports dating of the Arcadia fauna as Early Triassic rather than Late Permian (see discussion by Warren 1980).

SYSTEMATICS

Class OSTEICHTHYES
Subclass ACTINOPTERYGII
Order SAURICHTHYIFORMES
Family SAURICHTHYIDAE Goodrich 1909
Genus *Saurichthys* Agassiz 1834
Type Species *Saurichthys apicalis* Agassiz 1834
Saurichthys cf. *S. gigas* (Woodward 1890) = *Belonorhynchus*

MATERIAL: Single portion of skull between the posterior part of the orbitotemporal region and the anterior part of the labyrinthian region, covered by ornamented dorsal and lateral bones, and the corresponding mandibles. Queensland Museum specimen — QMF11942 (Pl. 1).

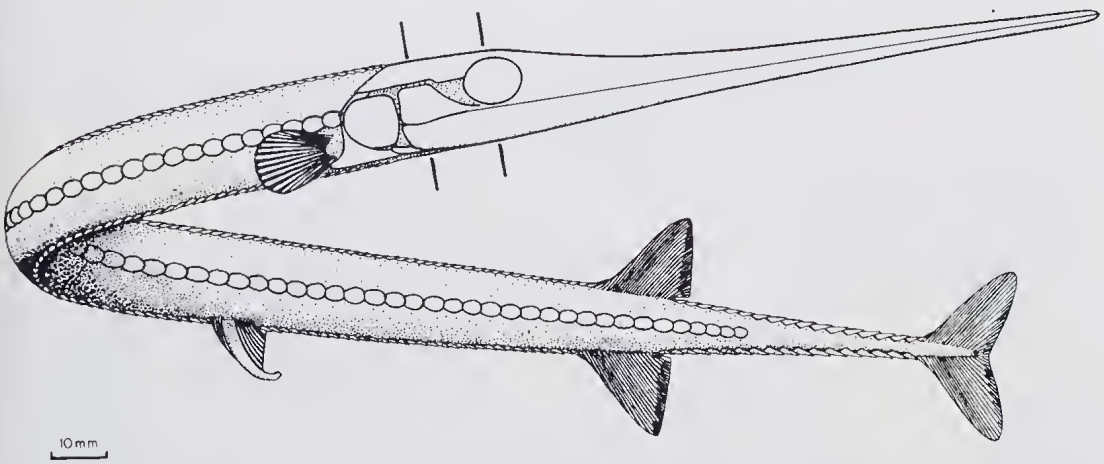

FIG. 1. Reconstruction of *Saurichthys calcaratus* (from Griffith 1977), with bars added to indicate skull region preserved in the Queensland *Saurichthys,* QMF11942.

LOCALITY: The Crater, on Rewan property, about 72 km southwest of Rolleston, SE Queensland (QM field locality L78). This locality, a steep-walled basin, has been described by Howie (1972) and by Thulborn (1979). The specimen was found lying loose in a gully on the western flank of the Crater.

HORIZON: Middle part of the Arcadia Formation, Rewan Group; Lower Triassic.

DESCRIPTION

The specimen represents the posterior part of the orbitotemporal region to the anterior otic region of an uncrushed, virtually undistorted skull, with corresponding dermal bones and mandibles in place. It is 29 mm long, a little deeper than wide (21 mm by 16 mm), and tapers slightly to the front. This fossil is almost rectangular in cross-section, with a flat roof and near-vertical sides, and is filled with dark brown ferruginous sandstone (see Fig. 2). The dermal bones are thin and rather fragile and in some places have been stripped away by weathering, making it difficult to trace sutures with certainty. A thin coating of ferruginous sand which covered the specimen, especially between mandibles and maxillae, has been removed with a fine needle.

Comparison with other *Saurichthys,* e.g. *S. ornatus* (Stensiö 1925) and *S. madagascariensis* (Beltan 1968, Rieppel 1980), indicates that the preserved area of the skull roof is probably formed by frontal, parietal and 'dermopterotic' (dermopterotic-extrascapular) bones (Pl. 1 A1, 2). In this specimen these bones are not demarcated by sutures, but their general relationships are indicated by variations in the ornament of the skull roof. Between the orbits (region of frontals) this ornament consists of small circular and elliptical tubercles without preferred orientation; behind the frontal region in the middle of the skull roof (region of parietals) is a whorl of elongate tubercles arranged concentrically; the greater part of the posterior and lateral dermal roof is occupied by 'dermopterotics' where the ornament consists of elongate tubercles aligned longitudinally.

The 'dermopterotic' bones curve down onto the sides of the skull. Part of the anterior portion of the left side is depressed with a small elliptical hole through it (Pl. 1 A1, 2, 'pw'). This may represent a part of the fossa Bridgei which extends on the dorsal face of the otic region (cf. Stensiö 1925), or alternatively, as it is still surrounded by ornamented bone, it may be a puncture wound. The 'dermopterotics' are separated from the bones of the cheek region by a definite gap, which forms a distinct groove on the left posterolateral side. The lower margin of the 'dermopterotic' above the orbit forms a slight overhang marked by a distinct notch.

Much of the cheek region is formed by a large triangular combined maxilla-preopercular (Pl. 1 B1, 2) with its ornament of fine and closely spaced striae trending down and slightly forwards so characteristic of the genus *Saurichthys.* The maxilla curves anteriorly to correspond to the posterior edge of the orbit and tapers to a slender process below the large space which would have accommodated the eye. The striae curve anteriorly to run parallel with the ventral edge of the maxilla. Scleral ossicles, supraorbitals and infraorbitals, which delimit the orbit in *Saurichthys* species, are not present in the specimen, as in *S. calcaratus* Griffith 1977. The ventral edge of the maxilla-preopercular is roughly horizontal, but extends downwards at the back to form a slight overlap on the mandible. The preopercular is poorly preserved and the suture line with the maxilla is not clear. The dermal ornament is weathered leaving an irregular line across the combined bones (Pl. 1 B2).

The robust mandible is elliptical in cross-section and accounts for some 40% of the total skull depth. It consists mainly of dentalosplenial and the ornament of near vertical striae is preserved on its upper half. No teeth are visible in the specimen, but this is not surprising since teeth of *Saurichthys,* where present, are often confined to the preorbital region of the skull and mandibles (see e.g. *S. nepalensis* Beltan & Janivier 1978; *S. obrutchevi* described by Minich 1981).

DISCUSSION

REMARKS ON RELATIONSHIPS

In its shape, its proportions, and the arrangement of its skull bones the specimen agrees closely with the equivalent regions of other *Saurichthys* skulls (see review by Beltan & Tintori 1980). The specimen shares the following distinctive features with other species of *Saurichthys:* the box-like shape of the skull with relatively narrow roof and deep flat sides; the combined maxilla-preopercular and exceptionally deep mandible with the ornament of striae; the skull roofing bones are demarcated not by sutures but by ornament.

There are six other reports of *Saurichthys* from the Triassic of Australia:

Saurichthys gigas (Woodward 1890) (*Belonorhynchus*), from the Narrabeen Group (Lower Triassic) of Gosford, NSW, and Hawkesbury Sandstone of Somersby Falls, NSW (Ritchie 1981);

Saurichthys gracilis (Woodward 1890) (*Belonorhynchus*), from the Narrabeen Group of Gosford, erroneously referred to as *B. elegans* by Wade (1940);

Saurichthys parvidens Wade 1935, from the Hawkesbury Sandstone (Middle Triassic) of Brookvale, NSW;

Saurichthys sp. from the Knocklofty Formation (Lower Triassic) of SE Tasmania (Banks *et al.* 1979);

Saurichthys sp. from the Blina Shale (Lower Triassic) of the Erskine Range, Western Australia (Warren 1980).

A specimen from Gosford, NSW, supposedly a saurichthyid, was figured by Eastman (1917, p. 281, pl. 14, fig. 3) who suggested it was an 'aberrant' form. More likely it is not a saurichthyid at all as it exhibits none of the features common to the family.

Only *Saurichthys gigas* and *S. gracilis* have been described in any detail (Woodward 1890); these two species differ principally in size and body proportions, the head with opercular apparatus occupying about one-third total length in *S. gigas* and about one-quarter in *S. gracilis*. Both of these forms have fine striations on maxillae and mandibles, but these striations have an irregular pattern in the hind portion of the mandibular of *S. gigas* and are oriented longitudinally, curving upwards behind in that of *S. gracilis*. In the Queensland specimen the posterior part of the jaws is missing and, consequently, the pattern is unknown. In *S. gigas* the skull roofing bones carry 'delicate ridges or striations' which are 'somewhat irregular and confused' (Woodward 1890, p. 24). Overall, the Queensland specimen is comparable to *S. gigas* in its basic structure and in the pattern of its dermal ornament. It seems to show fewer resemblances, except perhaps for size, to *S. gracilis,* which Woodward stated was of 'more delicate proportions'. In view of the similarities the Queensland specimen is provisionally designated *Saurichthys* sp., cf. *S. gigas*.

Most species of *Saurichthys,* including the Gosford specimens, have four longitudinal rows of scutes, often large ones (see Fig. 1). Rieppel (1980), however, has described a *Saurichthys madagascariensis* with a very well-preserved complete squamation. The patches of small actinopterygian scales reported from the Arcadia Formation do not appear to be like those described but it is possible that some scales may belong to very young *Saurichthys*.

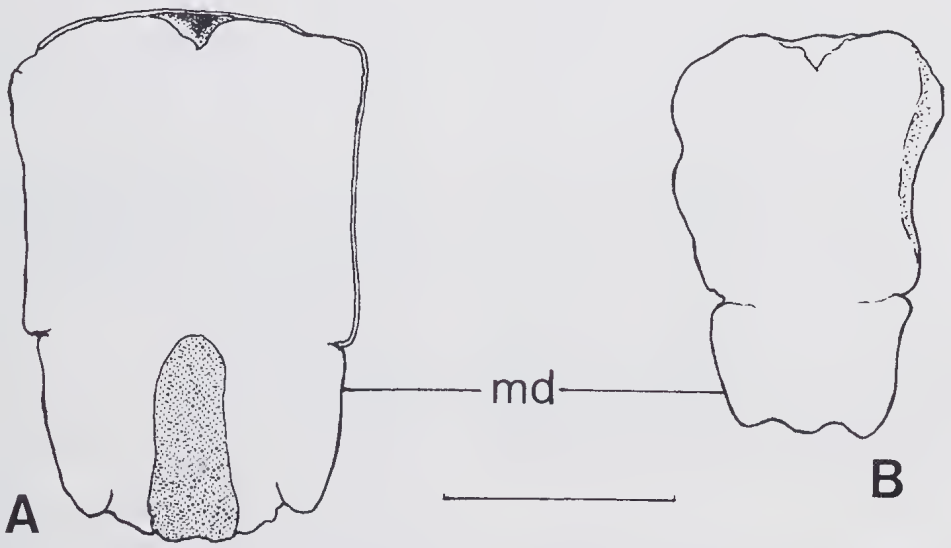

FIG. 2. *Saurichthys* cf. *S. gigas*. Diagrammatic cross-sections of QMF11942. A, ventral view showing thin dermal bones. At the midpoint of the dorsal edge is a v-shaped notch lined with endocranial bone. Between the mandibles is a plug of fine-grained pink sediment (stippled) otherwise the specimen is infilled with sandstone. B, dorsal view. Bar = 1 cm, md = mandible.

The genus *Saurichthys* is sometimes regarded as 'subholostean' (Romer 1966) and has been plaeed among the chondrostean fishes (Gardiner 1967). The relationship to other groups of bony fishes is uncertain and seems to be between the Palaeoniscidae and the sturgeons.

Palaeoecology

Saurichthys species were slim, long-bodied fishes resembling modern pike, *Esox,* and gar-pike, *Lepisosteus,* in general appearance, but possibly more like the recent *Belone,* an excellent swimming fish, in life-style with its fusiform body and rostrum resulting from the elongation of the ethmoidal region. The narrow box-like skull extended forwards as a long tapering beak armed with sharp conical teeth, in some cases representing up to one-third body length (see Fig. 1). *Saurichthys* species with reduced squamation also resemble living sturgeons (Acipenseriformes).

Saurichthys parvidens reached a length of at least 75 cm (Wade 1935), whereas Woodward (1890) estimated that *S. gigas* and *S. gracilis* attained at least 49 cm and 28 cm respectively. A recently found specimen of *S. gigas* was 70 cm long and Ritchie (1981) estimated a total length of 105 cm. On the basis of skull measurements it is estimated that the Rewan *Saurichthys* specimen had a body length of 28 to 32 cm.

Most *Saurichthys* species have been described as marine fishes (e.g. Berg 1958), though some, including the Australian forms, have been found in non-marine environments. Beltan and Tintori (1981) reviewed the distribution of *Saurichthys* and concluded that the genus was adapted to both marine and fresh waters. These authors mentioned the possibility that *Saurichthys* might have been a potamodromous fish which might swim up river to spawn. The Australian species have all been found in sediments interpreted as freshwater (see David (1890) and Ritchie (1981) on NSW environments; Banks *et al.* (1979) on Knocklofty and Blina Shale environments; Bartholomai (1979), Thulborn (1979) and Warren (1972, 1980) on the Arcadia environment), and may well have been restricted to freshwater, like the North American sturgeons, or anadromous and euryhaline, like the European sturgeons. In any event *Saurichthys* probably would have been an active predator on smaller fishes and tetrapods.

Age

The genus *Saurichthys* occurs worldwide in the Triassic: in Canada, Greenland, Spitsbergen, throughout Europe, and in the U.S.S.R., Turkey, Nepal, South Africa, Malagasy, and Australia (Beltan and Tintori 1981, Minich 1981). The genus first appears in the Early Triassic (Induan, Andrews *et al.* 1967; Eotriassic, Beltan and Tintori 1981). Consequently the presence of *Saurichthys* in the Arcadia Formation would seem to confirm that the associated fauna is Triassic, rather than Late Permian (cf. Warren 1980). Furthermore by comparison with other *Saurichthys* from Australia the dating would be Lower to Middle Triassic.

ACKNOWLEDGEMENTS

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NOTE ADDED IN PROOF

The folowing reference came to my attention too late to be included in the discussion:

DZIEWA, T.J., 1980. Early Triassic osteichthyans from the Knocklofty Formation of Tasmania. *Pap. Proc. Roy. Soc. Tasmania*, **114**: 145–60.

This mentions *Saurichthys* sp. from Coningham, Tasmania (pl. 7, 8,).

PLATE 1.

SAURICHTHYS CF. *S. GIGAS* (WOODWARD, 1890), QMF11942.

FIG. A1. Dorsal view of skull roof showing dermal ornament. Note central whorl of tubercles in parietal area, and lack of obvious sutures.

FIG. A2. Interpretation of A1, with depressed fractures in the frontal region. Abbreviations below.

FIG. B1. Left lateral view of skull showing dermal ornament of striations on the mandible and maxilla. Anterior is toward the region of the orbit filled with matrix.

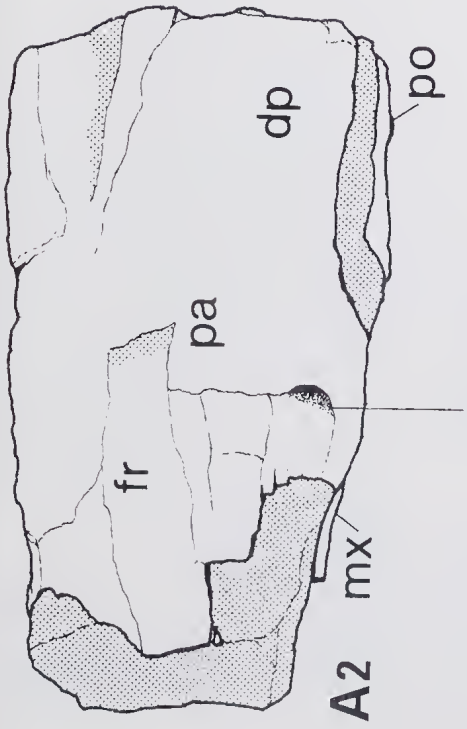
FIG. B2. Interpretation of B1.

Legend: dp — 'dermopterotic', fr — frontal, md — mandible, mx — maxilla, ob — orbit, po — preopercular, pw — hole in dermal roof, possibly a puncture wound, or alternatively the anterior fossa Bridgei.

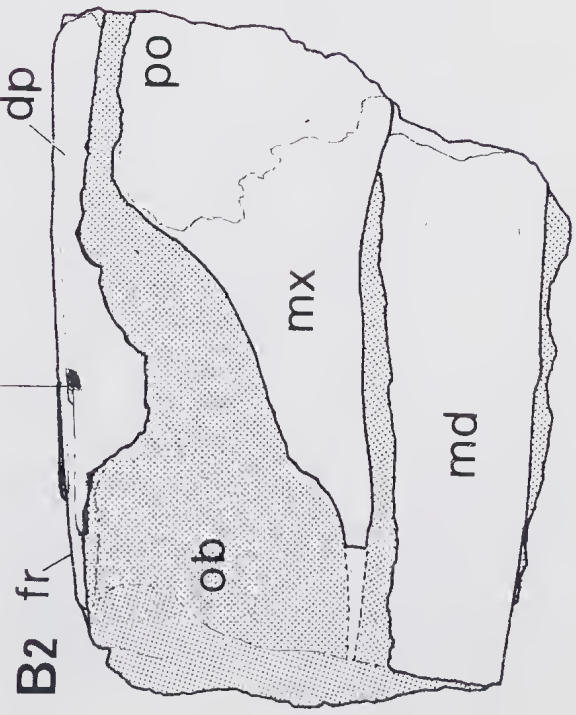
Stipple denotes matrix. All x 3.

A1

B1



A2



B2